

(19) World Intellectual Property Organization  
International Bureau



PCT



(43) International Publication Date  
16 March 2006 (16.03.2006)

(10) International Publication Number  
**WO 2006/028501 A3**

(51) International Patent Classification:

G01V 1/28 (2006.01) G01V 1/36 (2006.01)  
G01V 1/34 (2006.01)

(21) International Application Number:

PCT/US2005/006643

(22) International Filing Date:

28 February 2005 (28.02.2005)

(25) Filing Language:

English

(26) Publication Language:

English

(30) Priority Data:

60/548,515 26 February 2004 (26.02.2004) US

(71) Applicant (for all designated States except US): **SAUDI ARABIAN OIL COMPANY** [SA/SA]; R-3296, Administration Building, Dhahran 31311 (SA).

(72) Inventor; and

(75) Inventor/Applicant (for US only): **KELLOGG, Stephen, C.** [US/SA]; 4172 Lilac, Dhahran 31311 (SA).

(74) Agents: **SPATH, Thomas, E.** et al.; Abelman, Frayne & Schwab, 666 Third Avenue, New York, NY 10017-5621 (US).

(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM,

AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SM, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.

(84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IS, IT, LT, LU, MC, NL, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:

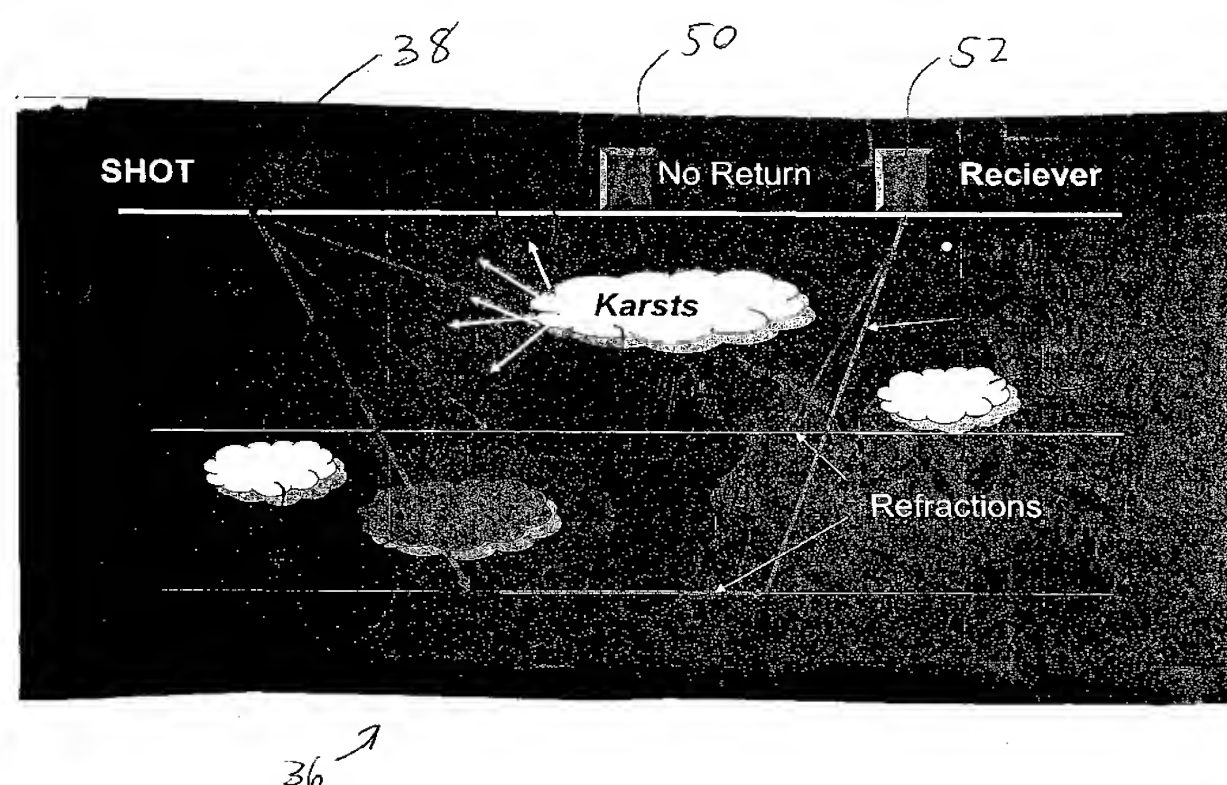
- with international search report
- before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments

(88) Date of publication of the international search report:

27 July 2006

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: PREDICTION OF SHALLOW DRILLING HAZARDS USING SEISMIC REFRACTION DATA



(57) Abstract: Shallow drilling hazards (44), such as karsts, caves, voids and unconsolidated discontinuities, that can pose significant risks to exploration and development well drilling operations are detected employing seismic refraction data on which a series of attribute analyses are performed, the resulting data being further processed to provide a three-dimensional visualization. Refracted wave raypaths (40, 46, 48) are highly distorted by encountering a karst feature with the occurrence of backscattering absorption. The resultant energy recorded at the surface receivers (52) is significantly reduced as compared to refracted waves recorded by other receivers (50) where no karsting is present. Multiple refractors are subjected to a relatively simple and rapid processing using commercially available software to track these differences and to map them in the near surface to improve the siting of wells and to alert drilling engineers and crews to the possibility of encountering the hazard.

WO 2006/028501 A3